IS 9128 (1999): Heavy duty dry batteries [ETD 10: Primary Cells and Batteries]

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भारतीय मानक

# हेवी ड्यूटी शुष्क बैटरियाँ — विशिष्टि

( पहला पुनरीक्षण )

*Indian Standard*

# HEAVY DUTY DRY BATTERIES — SPECIFICATION

*( First Revision )*

ICS 29 220



**BUREAU OF INDIAN STANDARDS**
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

*March* 1999

**Price Group 2**

FOREWORD

This Indian Standard ( First Revision ) was adopted by the Bureau of Indian Standards after the draft finalized by the Primary Cells and Batteries Sectional Committee had been approved by the Electrotechnical Division Council

The heavy duty dry cells covered by this standard are intended for applications where the current drain is higher than required for transistor radio applications and for longer periods than flashlights These cells are intended to be used with cassette tape recorders motor-operated toys heavy-duty lightings, calculators, etc These cells are not intended for use with reel-to-reel tape recorders and other applications where still higher current drains are required

To protect the equipment using these cells from damage due to leakage of electrolyte this standard lays down a test which would ensure that there would be no leakage even when the cells are used beyond their recommended life

This revision has been undertaken to include the following

— Performance requirements for R03 batteries

The performance requirements of R6 batteries to cover applications for toys/heavy duty lighting have been added - Requirements of life of batteries of R6, R14 and R20 have been increased

Requirements of life of batteries after a storage period of 12 months also have been specified

- Requirements for delayed life under dry heat conditions have been made more severe

In general life expectancy from the dry batteries has been increased keeping in view the advancement in dry cell technology

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value observed or calculated expressing the result of a test, shall be rounded off in accordance with IS 2 1960 'Rules for rounding off numerical values ( *revised* ) The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard

## AMENDMENT NO. 1 OCTOBER 2000
## TO
## IS 9128 : 1999 HEAVY DUTY DRY BATTERIES — SPECIFICATION

*( First Revision )*

( *Page* 2, *Table* 1, *col* 6, *row* 1 ) — Insert '5 days/week'.

( *Page* 2, *Table* 1, *col* 6, *row* 2 ) — Insert '5 days/week'.

( *Page* 2, *Table* 1, *col* 6, *row* 3 ) — Insert '5 days/week'.

( *Page* 2, *Table* 1, col 6, *row* 4 ) — Insert '5 days/week'.

( *Page* 2, *Table* 1, *col* 7, *row* 3 ) — Substitute '0.75' *for* '0.90'.

( ETD 10 )

Reprography Unit, BIS, New Delhi, India

# AMENDMENT NO. 2 FEBRUARY 2006
# TO
# IS 9128 : 1999 HEAVY DUTY DRY BATTERIES — SPECIFICATION

*( First Revision )*

( *Page* 1, *clause* 7.1, *line* 1 ) — Substitute 'terminal' *for* 'terminals'

( *Page* 2, *Table* 1 ) — Substitute the following for the existing table

**Table 1 Requirements**
( *Clauses* 5 1, 8, 10 5 *and* 10 6 2 )

| Designation | Nominal Voltage (V) | Dimensions | | Discharge Resistance | Discharge Duration | End Voltage | Life Tests[1] | | | | Application |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Diameter (mm) | Height (mm) | (Ohms) | | (V) | Initial | Delayed (6 Months) | Delayed (12 Months) | Delayed (Dry Heat) | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| R03 | 1 5 | 10 5 +0 -1 | 44 5 + 0 - 2 | 5 | 4 min/h 8 h/day 5 days/week | 0 9 | 45 | 36 | 32 | 34 | Portable lighting |
| | 1 5 | 10 5 +0 -1 | 44 5 + 0 - 2 | 10 | 1 h/day 5 days/week | 0 9 | 84 | 65 | 60 | 62 | Personal cassette Player/ tape recorder |
| R6 | 1 5 | 14 5 +0 -1 | 50 5 + 0 - 1 5 | 1 | 15 s/min 1 h/day | 0 75 | 60 cycles | 48 cycles | 42 cycles | 45 cycles | Photo-flash |
| | 1 5 | 14 5 + 0 - 1 | 50 5 + 0 - 1 5 | 4 | Continuous | 0 9 | 50 | 40 | 35 | 36 | Toy/ Heavy duty lighting |
| | 1 5 | 14 5 + 0 - 1 | 50 5 + 0 - 1 5 | 10 | 1 h/day 5 days/week | 0 9 | 300 | 240 | 210 | 228 | Personal cassette Player/ tape recorder |
| R14 | 1 5 | 26 2 + 0 - 1 5 | 50 0 + 0 -1 5 | 4 | 30 min/day 5 days/week | 0 9 | 225 | 180 | 160 | 168 | Toy/ Heavy duty lighting |
| | 1 5 | 26 2 + 0 - 1 5 | 50 0 + 0 -1 5 | 15 | 2 h/day 5 days/week | 0 9 | 20 h | 16 h | 14 h | 15 h | Cassette recorder |
| R20 | 1 5 | 34 2 + 0 - 2 0 | 61 5+ 0 -2 0 | 2 25 | 30 min/day 5 days/week | 0 9 | 300 | 240 | 210 | 225 | Toy/ Heavy duty lighting |
| | 1 5 | 34 2 + 0 - 2 0 | 61 5+ 0 -2 0 | 15 | 2 h/day 5 days/week | 0 9 | 40 h | 32 h | 28 h | 30 h | Cassette recorder |

1) Values in minutes unless indicated otherwise

( *Page* 3, *clause* 10.5.1 ) — Substitute 'accordance' *for* 'accordanced'

( *Page* 3, *Table* 2 ) — Add the following matter after Table 2

'11 CODE OF PRACTICE FOR USE AND DISPOSAL OF BATTERIES

11.1 Refer Annex B of IS 6303.

12 ACCELERATED ACCEPTANCE TEST

12.1 For the purpose of accepting a manufactured lot of batteries by any customer/agency, the following accelerated acceptance shall be carried out for conformance to performance standards.

NOTE — Accelerated tests are intended for quick acceptance of manufactured lot. However, type tests as laid down under 10.2 shall be performed for full conformance

| Sl No. | Battery Type | Resistance (Ohms) | Discharge Schedule | End Voltage (V) | Rated Life |
|---|---|---|---|---|---|
| 1 | R6 | 1 | 15 s/min 1 h/day | 0 75 | 60 cycles |
| 2 | R14 | 4 | Continuous | 0 90 | 135 min |
| 3 | R20 | 2 25 | Continuous | 0 90 | 120 min |
| 4 | R03 | 5 | Continuous | 0 90 | 40 min |

NOTES

1 The batteries shall not show any signs of leakage during the discharge period up to the end point voltage.
2 One cycle means 15 seconds discharge followed by 45 seconds rest

( ET 10 )

**AMENDMENT NO. 2 FEBRUARY 2006**
**TO**
**IS 9128 : 1999 HEAVY DUTY DRY BATTERIES — SPECIFICATION**

***( First Revision )***

( *Page* 1, *clause* **7.1**, *line* 1 ) — Substitute 'terminal' *for* 'terminals'

( *Page* 2, *Table* 1 ) — Substitute the following for the existing table

**Table 1 Requirements**
( *Clauses* 5.1, 8, 10.5 *and* 10.6.2 )

| Designation | Nominal Voltage (V) | Dimensions | | Discharge Resistance | Discharge Duration | End Voltage | Life Tests[1] | | | | Application |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Diameter (mm) | Height (mm) | (Ohms) | | (V) | Initial | Delayed (6 Months) | Delayed (12 Months) | Delayed (Dry Heat) | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| R03 | 1.5 | 10.5 +0 -1 | 44.5 +0 -2 | 5 | 4 min/h 8 h/day 5 days/week | 0.9 | 45 | 36 | 32 | 34 | Portable lighting |
| | 1.5 | 10.5 +0 -1 | 44.5 +0 -2 | 10 | 1 h/day 5 days/week | 0.9 | 84 | 65 | 60 | 62 | Personal cassette Player/ tape recorder |
| R6 | 1.5 | 14.5 +0 -1 | 50.5 +0 -1.5 | 1 | 15 s/min 1 h/day | 0.75 | 60 cycles | 48 cycles | 42 cycles | 45 cycles | Photo-flash |
| | 1.5 | 14.5 +0 -1 | 50.5 +0 -1.5 | 4 | Continuous | 0.9 | 50 | 40 | 35 | 36 | Toy/ Heavy duty lighting |
| | 1.5 | 14.5 +0 -1 | 50.5 +0 -1.5 | 10 | 1 h/day 5 days/week | 0.9 | 300 | 240 | 210 | 228 | Personal cassette Player/ tape recorder |
| R14 | 1.5 | 26.2 +0 -1.5 | 50.0 +0 -1.5 | 4 | 30 min/day 5 days/week | 0.9 | 225 | 180 | 160 | 168 | Toy/ Heavy duty lighting |
| | 1.5 | 26.2 +0 -1.5 | 50.0 +0 -1.5 | 15 | 2 h/day 5 days/week | 0.9 | 20 h | 16 h | 14 h | 15 h | Cassette recorder |
| R20 | 1.5 | 34.2 +0 -2.0 | 61.5 +0 -2.0 | 2.25 | 30 min/day 5 days/week | 0.9 | 300 | 240 | 210 | 225 | Toy/ Heavy duty lighting |
| | 1.5 | 34.2 +0 -2.0 | 61.5 +0 -2.0 | 15 | 2 h/day 5 days/week | 0.9 | 40 h | 32 h | 28 h | 30 h | Cassette recorder |

1) Values in minutes unless indicated otherwise

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NOTE — Accelerated tests are intended for quick acceptance of manufactured lot However, type tests as laid down under **10.2** shall be performed for full conformance

| Sl No. | Battery Type | Resistance (Ohms) | Discharge Schedule | End Voltage (V) | Rated Life |
|---|---|---|---|---|---|
| 1 | R6 | 1 | 15 s/min 1 h/day | 0 75 | 60 cycles |
| 2 | R14 | 4 | Continuous | 0 90 | 135 min |
| 3 | R20 | 2 25 | Continuous | 0 90 | 120 min |
| 4 | R03 | 5 | Continuous | 0 90 | 40 min |

NOTES

1 The batteries shall not show any signs of leakage during the discharge period up to the end point voltage
2 One cycle means 15 seconds discharge followed by 45 seconds rest

( ET 10 )



Reprography Unit, BIS, New Delhi, India

*Indian Standard*

# HEAVY DUTY DRY BATTERIES — SPECIFICATION

*( First Revision )*

## 1 SCOPE

This standard lays down dimensions, tests and requirements of Leclanche type dry batteries of designations R03 for use in portable lighting and personal cassette player, R6 for use in photoflash equipment and pocket calculators, and R14 and R20 for use in cassette tape recorders, toys and heavy duty

## 2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard

| *IS No* | *Title* |
|---|---|
| IS 1885 ( Part 15 ) 1967 | Electrotechnical vocabulary Part 15 Primary cells and batteries |
| 2652 1976 | Schedule of terminals for Leclanché type primary batteries (*first revision*) |
| 4905 1968 | Methods for random sampling |
| 6303 1984 | General requirements and tests for dry cells and batteries |

## 3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1885 ( Part 15 ) and IS 6303 shall apply

## 4 DESIGNATION

The cells shall be designated in accordance with 3 of IS 6303

## 5 DIMENSIONS

### 5.1 Cells

Nominal voltage and the overall dimensions of R03 R6, R14 and R20 cells shall conform to the values given in Table 1

## 6 MATERIALS AND CONSTRUCTION

The materials and construction shall be in accordance with 5 of IS 6303

## 7 TERMINALS

**7.1** The terminals arrangements shall be of type CD and FC as given in IS 2652

**7.2** The terminals shall provide and maintain good electrical contact with the external circuit and shall be so secured in the cells that they are not displaced by insertions and withdrawls in normal use

## 8 REQUIREMENTS

The performance requirements of R03, R6, R14 and R20 cells shall be as given in Table 1

## 9 MARKING

**9.1** The marking shall be done in accordance with 6 of IS 6303

**9.1.1** In addition, the following marking shall also be done

Application of the cells, normally 'Heavy duty' on the outside of the cells Alternatively, the applications may be depicted by suitable pictorial markings

## 10 TESTS

### 10.1 General

Provisions of 7.1 to 7.3 for IS 6303 shall apply

### 10.2 Type Tests

**10.2.1** The following shall constitute the type tests

a) Checking of dimensions and terminals ( 5 and 7 ),

b) Checking of markings ( 9 ),

c) Initial life test ( 10.4 ),

d) Delayed life test ( 10.5 ),

e) Materials and construction ( 6 ),

f) Delayed life test under dry heat conditions 10.6, and

g) Resistance to leakage of electrolyte ( 10.7 )

**10.2.1.1** *Samples for type tests*

The number of samples for each cell designation and each application required for type tests shall be as under

| | *No of Samples* |
|---|---|
| Checking of dimensions and terminals | All samples |
| Checking of markings | |
| Initial life test | 3 |
| Delayed life test | 3 |

**Table 1 Requirements**

( *Clauses* 5 1, 8, 10 5, 10 6 2, 10 7 1 *and* 10 7 2 )

| Designation | Nom Volt (v) | Dimensions | | Discharge Resistance | Discharge Duration | End Point | Life Tests[1)] | | | | Application |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dia (mm) | Height (mm) | (ohms) | | (v) | Initial | Delayed (6 Months) | Delayed (12 Months) | Delayed (Dry Heat) | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| R 03 | 1 5 | 10 5 + 0 − 1 | 44 5 − 0 − 2 | 5 0 | 4 min h 8 h day | 0 90 | 45 | 36 | 32 | 34 | Portable lighting |
| | 1 5 | | | 10 0 | 1 h day | 0 90 | 84 | 65 | 60 | 62 | Personal cassette player/ tape recorder |
| R 6 | 1 5 | 14 5 + 0 − 1 | 50 5 + 0 − 1 5 | 1 | 15 s/min 1 h/day | 0 90 | 60 cycles | 48 cycles | 42 cycles | 45 cycles | Photoflash |
| | 1 5 | | | 4 | 1 h/day | 0 90 | 50 | 40 | 35 | 36 | Toy, Heavy duty lighting |
| | 1 5 | | | 10 | 1 h/day 5 days/week | 0 90 | 300 | 240 | 210 | 228 | Personal cassette player/ Tape recorder |
| R 14 | 1 5 | 26 2 + 0 − 1 5 | 50 0 + 0 − 1 5 | 4 | 30 min day 5 days week | 0 90 | 225 | 180 | 160 | 168 | Toy/Heavy duty lighting |
| | 1 5 | | | 15 | 2 h day 5 days/week | 0 90 | 20 h | 16 h | 14 h | 15 h | Cassette recorder |
| R 20 | 1 5 | 34 2 + 0 − 2 0 | 61 5 + 0 − 2 0 | 2 25 | 30 min/day 5 days/week | 0 90 | 300 | 240 | 210 | 225 | Toy/Heavy duty lighting |
| | | | | 15 | 2 h/day 5 days/week | 0 90 | 40 h | 32 h | 28 h | 30 h | Cassette recorder |

[1)] Values in minutes unless indicated otherwise

| | *No of Samples* |
|---|---|
| Delayed life test after 12 months | 3 |
| Materials and constructions | 1 |
| Delayed life test under dry heat conditions | 3 |
| Resistance to leakage of electrolyte | 10 |
| Total | 23 |

**10.3 Acceptance Tests**

The following shall constitute the acceptance tests

a) Checking of dimensions and terminals ( 5 and 7 ),

b) Checking of markings ( 9 ), and

c) Initial life test (for each application and each cell designation) ( **10.4** )

**10.3.1** The samples for acceptance tests and criteria for acceptance shall be in accordance with Annex A

**10.4 Initial Life Test**

**10.4.1** The test shall be carried out in accordance with 7.5 of IS 6303, with the details given in Table 1

**10.4.2** The following readings shall be taken

a) Initial closed-circuit voltage, and

b) Closed-Circuit voltage at the end of each discharge period

**10.4.3** The test shall be continued until the closed-circuit voltage of the cell falls below the appropriate end-point voltages specified in Table 1 The life of the cells shall include the full discharge period for the day during which the voltage drops for the first time below the specified end-point for the cell

**10.4.4** The cells shall not show leakage during or at the end of the test

**10.5 Delayed Life Test**

**10.5.1** The test shall be carried out in accordance with 7.7 of IS 6303

**10.5.2** The cells shall be stored for a period as specified in Table 1

**10.5.3** After storage the cells shall be tested in accordance with **10.4** The batteries shall meet the requirements specified in Table 1

**10.5.4** The cells shall not show leakage during storage, during discharge or at the end of discharge

**10.6 Delayed Life Test Under Dry Heat Conditions**

**10.6.1** The cells shall be stored in accordance with **7.8.1** of IS 6303

**10.6.2** After storage the cells shall be tested for life as in **10.4** The rated life of the batteries shall be not less than the appropriate values in Table 1

**10.6.3** The cells shall not show leakage during storage, during discharge or at the end of discharge

**10.7 Resistance to Leakage of Electrolyte**

**10.7.1** At a temperature of 27 ± 2°C the cell shall be continuously discharged through the resistance as specified in Table 2 The discharge shall be continued until the closed-circuit voltage falls below the appropriate end-point voltage specified in Table 2

**10.7.2** The cells shall show no leakage of the electrolyte up to the end point voltage specified in Table 2

**Table 2 Discharge Conditions to Test Resistance to Leakage of Electrolyte**

*( Clauses 10 7 1 and 10 7 2 )*

| Cell Size | Discharge Conditions | |
|---|---|---|
| | Load Resistance | End-Point Voltage |
| (1) | (2) ohms | (3) V |
| R03 | Under Consideration | — |
| R6 | 10 | 0 7 |
| R14 | 4 | 0 7 |
| R20 | 4 | 0 7 |

# ANNEX A

( *Clause* 10 3 1 )

## SAMPLING SCHEME FOR ACCEPTANCE OF HEAVY DUTY DRY CELLS

### A-1 LOT

**A-1.1** In any consignment, all the cells of the same designation and rated voltage manufactured by the same factory, during the same period shall be grouped together to constitute a lot

**A-1.1.1** Cells shall be taken and tested for each lot A cell failing to satisfy any one of the appropriate requirements shall be called a defective

### A-2 SCALE OF SAMPLING

**A-2.1** Cells shall be selected at random from each lot in accordance with Table 3 For the purpose of random selection provisions contained in IS 4905 shall be used

### A-3 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

**A-3.1** The cells shall be drawn according to col 1 and 2 of Table 3 and shall be divided into three groups such that each group shall have a sample size ($n_1$) as mentioned in col 3 of Table 3

**A-3.1.1** Out of three groups, one group shall be tested for dimensions, terminals and markings and the other two groups shall be tested for initial life tests for both the applications

**A-3.2** In any group, if the number of defective cells is less than or equal to $C_1$ the lot shall be considered as conforming to that requirements If the number of defectives in a group is greater than or equal to $C_2$ the lot shall be declared to have failed for that requirements In any group, if the number of defective cells lies between $C_1$ and $C_2$, a further sample of size as mentioned in col 4 ($n_2$) shall be drawn and tested for that group requirement If the number of defectives in the combined sample ($n_1 + n_2$) is greater than or equal to $C_3$ the lot shall be rejected, otherwise not

**A-3.3** The lot shall be declared to have conformed to the specification when the cells conform to the requirements as mentioned in **A-3.1** and **A-3.2**

**Table 3 Sampling Plan**

( *Clauses* A-2 1 *and* A-3 1 )

| Lot Size | Number of Samples for R14 and R20 | First Stage $n_1$ | Second Stage | $(n_1 + n_2)$ | $C_1$ | $C_2$ | $C_3$ |
|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Up to 300 | 15 | 5 | 5 | 10 | 0 | 2 | 2 |
| 301 to 1 000 | 24 | 8 | 8 | 16 | 0 | 2 | 2 |
| 1 001 " 3 000 | 39 | 13 | 13 | 26 | 0 | 3 | 4 |
| 3 001 " 10 000 | 60 | 20 | 20 | 40 | 1 | 4 | 5 |
| 10 001 " 35 000 | 96 | 32 | 32 | 64 | 2 | 5 | 7 |
| 35 001 " 150 000 | 150 | 50 | 50 | 100 | 3 | 7 | 9 |
| 150 001 " 500 000 | 240 | 80 | 80 | 160 | 5 | 9 | 13 |
| 500 001 and above | 375 | 125 | 125 | 250 | 7 | 11 | 19 |

NOTE — The sampling plan given in the table envisages that lots containing about 4 percent defective cells will be accepted 95 percent of times, and lots containing 15 percent to 30 percent defective cells will be rejected 90 percent of times

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Amendments are issued to standards as the need arises on the basis of comments Standards are also reviewed periodically, a standard along with amendments is reaffirmed when such review indicates that no changes are needed, if the review indicates that changes are needed, it is taken up for revision Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'.

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